

A NEW EULIINE GENUS FROM COSTA RICA AND VENEZUELA (LEPIDOPTERA: TORTRICIDAE)

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Abstract.—*Eubetia*, new genus, is described and illustrated from Central and South America. The new genus includes two species: *E. bigaulae*, new species, (type species) from Venezuela, and *E. hoop*, new species, from Costa Rica. Adults are superficially most similar to *Anopina* Obraztsov and *Odonthalitus* Razowski; male genitalia are most similar to *Anopinella* Powell. The male of *E. bigaulae* possesses a preponderance of putative secondary sexual characters, including the typical euliine foreleg hairpencil, a swollen area near the base of the forewing costa, a dense patch of elongate androconial scales on the lower surface of the forewing, modified scales in the anal and costal regions of the hindwing, and a band of specialized scales at the terminal edge of abdominal segment IX. In addition, the male of this species has an unusual row of dense, ascending scales on the lower frons, and forewing veins M_3 and CuA_1 are stalked; the latter two features are found in no other Euliini.

Key words: Neotropical, phylogeny, Euliini, systematics, secondary sexual structures.

In Lepidoptera, male secondary structures are considered to be of limited value in phylogenetic inference because they usually are evolutionarily more labile than other morphological features. Hence, their position in the transformation series “primitively absent-present-secondarily lost” cannot be determined with certainty. Nonetheless, the tortricid tribe Euliini is defined, in part, by the presence of a unique foreleg hairpencil in the male, although this structure is secondarily lost in many species and genera (Brown 1990; Brown & Powell 1991). In contrast to Olethreutinae (Tortricidae), where many members possess numerous and diverse male secondary structures (e.g., Brown 1983; Brown & Miller 1983), sexual structures are rare in Euliini (Tortricinae), with the exception of the foreleg hairpencil. A few species of *Anopina* Obraztsov and one species of *Inape* Razowski have a patch of androconial scales along the costa of the upper surface of the hindwing; and one species of *Accuminulia* Brown has modified sex scales covering the basal one-half of the upper surface of the hindwing.

During continuing studies on the phylogeny and biogeography of the tortricid tribe Euliini, I discovered an undescribed species that possesses a preponderance of putative secondary sexual characters, including the typical euliine foreleg hairpencil, a densely scaled, swollen area near the base of the forewing costa, a dense patch of elongate androconial scales on the lower surface of the forewing, modified scales in the anal and costal regions of the hindwing, and a band of specialized scales around the terminal edge of abdominal segment IX. A new genus is described to accommodate this and a second new species.

MATERIALS AND METHODS

Taxonomic material was studied at the following institutions: The Natural History Museum (BMNH), London, England; Instituto Nacional de Biodiversidad (INBio), Santo Domingo, Costa Rica; Essig Museum of Entomology (UCB), University of California, Berkeley, U.S.A.; and National Museum of Natural History (USNM), Smithsonian Institution, Washington, D.C., U.S.A.

Dissection methodology follows that summarized in Brown and Powell (1991). Wing venation was studied through the examination of stained, slide-mounted preparations ($n = 2$) and by placing a drop of 95% ethanol on the wings of pinned, spread adult moths ($n = 4$). Illustrations of genitalia and wing venation were drawn either with the aid of a microprojector or a camera-lucida attachment. Forewing measurements were made with an ocular micrometer mounted in a dissecting microscope. Terminology for wing venation and genitalic structures follows Horak (1984). Abbreviations and symbols are as follows: FW = forewing; HW = hindwing; n = number of specimens examined; ca. = circa (approximately); \bar{x} = mean.

SYSTEMATICS

Eubetia, new genus

Type species. *Eubetia bigaulae*, new species.

Description. *Head.* Antennal cilia in male ca. 1.0–1.1 times width of flagellomere; cilia in female less than 0.1 times flagellar segment diameter. Labial palpus moderate in length, ca. 1.5 times horizontal diameter of eye; segment II weakly upturned, expanded distally by scaling; segment III ca. 0.2–0.3 as long as II, smooth-scaled, exposed. Maxillary palpus rudimentary. Proboscis well developed. Lower frons either smooth-scaled or with dense row of ascending scales (male of *E. bigaulae*; Figs. 1, 2); vertex usually with typical overhanging tuft of scales. Ocelli present. Chaetosema present. *Thorax:* Smooth-scaled. Male foreleg hairpencil present (Fig. 3). *Forewing* (Fig. 4): Length ca. 3.0 times width; length of discal cell ca. 0.60 FW length; greatest width of discal cell ca. 0.14 its length; CuA_2 originates ca. 0.5 along length of discal cell; CuA_1 and M_3 long-stalked (*E. bigaulae*) or separate (*E. boop*); CuP absent; chorda and M-stem absent. No upraised scale tufts; male without costal fold, with (*E. bigaulae*) or without (*E. boop*) swollen lobe at costa near wing base. Under surface with (*E. bigaulae*) or without (*E. boop*) patch of elongate androconial scales. *Hindwing* (Fig. 4): $Sc + R$ and R_s closely approximate; R_s and M_1 stalked or connate; M_3 and CuA_1 variably stalked; CuP present; M-stem absent; tuft of hairlike scales along $1A + 2A$, originating near base of wing. *Abdomen:* Dorsal pits absent; no modified corethrogyne scaling in female. *Male genitalia* (Figs. 7, 8): Uncus moderately long, gently curved, slightly broadened distally. Socius somewhat rounded, pendant, with fine setae, lacking conspicuous scales; not fused to gnathos. Gnathos arms slender, with an elongate, narrow distal plate at junction of arms, and lateral process either near base or middle. Subscaphium absent, although anal tube conspicuous; hami absent. Transtilla incomplete, with a pair of slender, attenuate processes basally, membranous at middle. Valva narrow, elongate, broadened apically, with eucosminelike cucullus covered with fine setae and perimeter of spines; basal portion of costa membranous, remainder sclerotized; sacculus weak, an elon-



Figs. 1–3. Head and forelegs of *E. bigaulae*. 1. Head, front view; 2. Head, side view. Arrows indicate ascending scales of lower frons; 3. Forelegs with hairpencil expanded.

gate spine- or thornlike processes from near mid-venter of valva. Pulvinus absent. Vinculum complete, well developed, v-shaped. Juxta an irregular plate. Aedeagus large, straight or only slightly curved, with or without strongly sclerotized distal appendages; cornuti in the form of irregularly angled sclerites. *Female genitalia* (Figs. 9, 10): Papillae anales moderately broad, flattened. Apophyses short and slender. Sterigma a simple, weakly scobinate band; antrum represented by a large, broad funnel. Ductus bursae moderately long, coiled one revolution, with irregular wrinkles

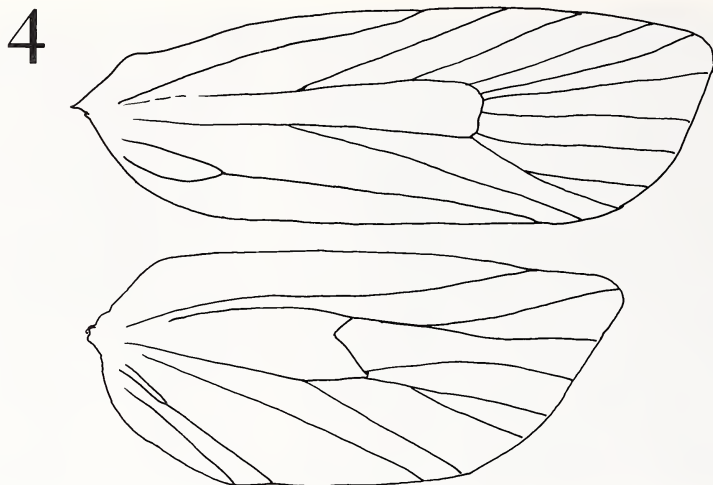


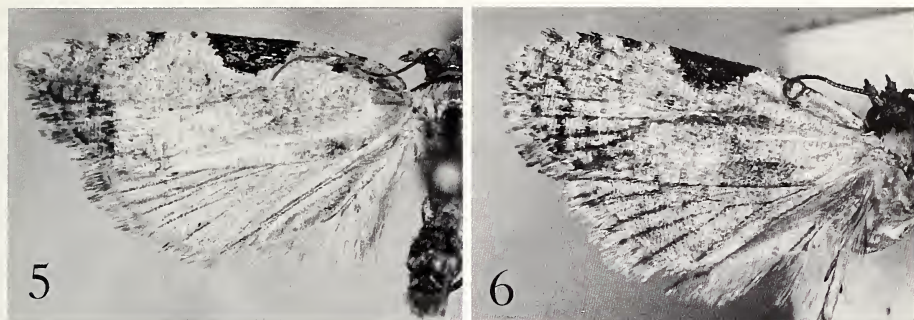
Fig. 4. Wing venation of male *Eubetia bigaulae*.

and punctations; colliculum developed in the form of a long, slender, irregular sclerite. Corpus bursae irregularly rounded; spicules and signum lacking. Accessory bursa absent. Ductus seminalis from proximal portion of corpus.

Discussion. Superficially, adults of *Eubetia* are similar to *Anopina* Obraztsov and *Odonthalitus* Razowski in forewing shape, length, and maculation. *Eubetia* can be distinguished from *Odonthalitus* by the absence of the basal patch on the forewing, the shorter antennal cilia in the male (1.0 vs. 3.0–4.0 times flagellar width), and the presence of a foreleg hairpencil in the male. *Eubetia* can be distinguished from *Anopina* by the more shallow semicircular patch from the costa of the forewing and the shorter antennal cilia in the male (1.0 vs. 3.0–5.0 times flagellar width). The male genitalia of *Eubetia* are unlike those of either *Anopina* or *Odonthalitus*, and are most similar to those of *Anopinella* Powell in the development of a eucosminelike cucullus in the valva and the presence of a spine- or thornlike process from near the mid-venter of the valva. The latter two features may represent synapomorphies for the two genera. Autapomorphies for *Eubetia* include the upturned apex of the costa of the valva, the elongate mesal distal plate at the joined gnathos arms, the large funnel-shaped antrum, and the wrinkly, coiled ductus bursae. The stalked condition of veins CuA_1 and M_3 in the forewing, the dense row of ascending scales on the lower frons, and the dense patch of elongate androconial scales on the under surface of the forewing of *E. bigaulae* are features found in no other Euliini species, not even in the congener *E. boop*.

Distribution and Biology. *Eubetia* is known from montane forest habitat at mid-elevations (1100–1500 m) in Costa Rica and Venezuela. Adults were collected at blacklight. Nothing is known of the early stages.

Etymology. The genus name is an arbitrary combination of letters and is considered a noun of feminine gender.



Figs. 5–6. Adult females of *Eubetia*. 5. *E. bigaulae*; 6. *E. boop*.

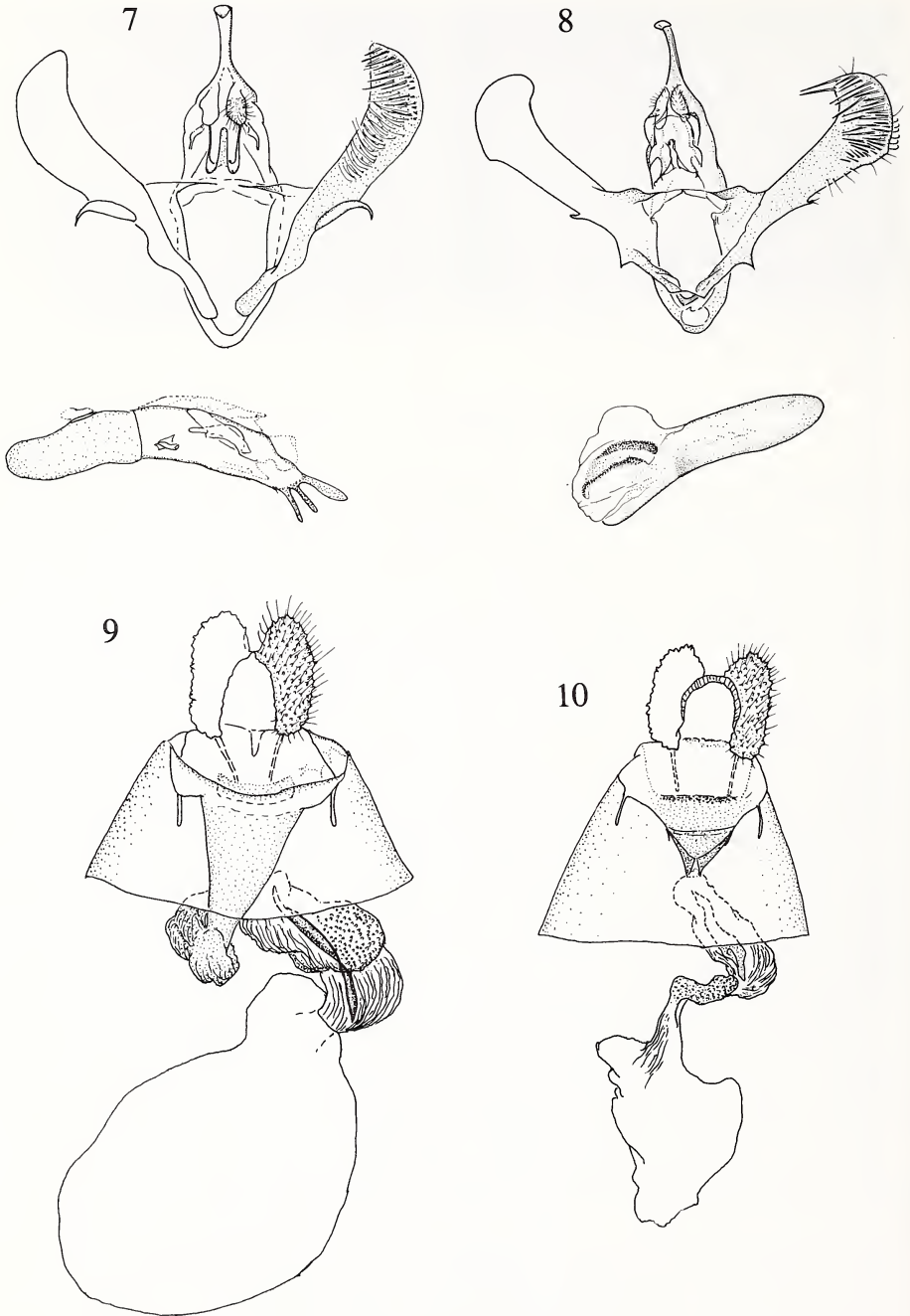
***Eubetia bigaulae*, new species**

Figs. 1–5, 7, 9

Description. *Male. Head.* Lower frons with dense row of ascending, light tan scales (Figs. 1, 2), upper frons smooth-scaled without overhanging tuft, tan, with whitish central portion; vertex pale tan, mixed with brown. Labial palpus pale orange-tan, mixed with brown mesally and laterally. Antennal scaling brown. *Thorax.* Pale yellow-gold with red-brown prothoracic collar. *Forewing* (Figs. 4, 5): Length 7.0–8.0 mm (\bar{x} = 7.4 mm; n = 10); slightly expanded lobe near base of costa. Upper side pale yellow with pinkish-tan and pale reddish-brown overscaling; reddish brown or brown semicircular patch bordering costa ca. 0.40–0.60 distance from base; small, irregular, brown spot at costa ca. 0.2 distance from base to apex, with a similar spot immediately below; usually with additional small brown spots along costa; diffuse red-brown semicircular patch in terminal region. Fringe pale tan-gray. Under side moderately uniform dark tan-brown; large patch of elongate androconial scales arising near base, extending nearly to apex of discal cell. *Hindwing.* Upper side light gray-brown, with larger, paler sex scales in anal region and along costa. Fringe grayish white. Under side light gray-brown. *Genitalia.* As in Fig. 7 (drawn from USNM slide 88637, Venezuela; n = 3). Tegumen rather long and narrow. Uncus slightly broadened apically. Socius rounded, pendant. Gnathos arms with slender lateral lobe near base. Valva narrow, broadest distally, with upturned apex; distal 0.5 of valva eucosminelike, with fine setae and spines; sacculus weakly differentiated, undulate at base; a long, slightly curved thorn from venter of valva ca. 0.5 distance from base to apex. Aedeagus broad, slightly curved, with three digitate, sclerotized processes distally; phallobase large; vesica with several irregular sclerites.

Female. FW length 6.5–8.0 mm (\bar{x} = 7.5 mm; n = 10) (Fig. 5). Superficially as in male, except forewing markings slightly more defined, and lacking foreleg hair-pencil and secondary sexual scaling on forewing and hindwing. *Genitalia.* As in Fig. 9 (drawn from USNM slide no. 88638, Venezuela; n = 2). Sterigma a broad, weakly spiculate band, with more strongly sclerotized patch just above ostium. Antrum large, funnel-shaped. Ductus bursae moderately long, coiled one revolution, with fine wrinkly lines; colliculum present in the form of an elongate, slightly curved band. Corpus bursae irregularly rounded.

Types. Holotype, ♂, VENEZUELA, Aragua, Rancho Grande, cloud forest [1100



Figs. 7-10. Genitalia of *Eubetia*, males with valvae spread, aedeagus removed. 7. Male genitalia of *E. bigaulae*; 8. Male genitalia of *E. boop*; 9. Female genitalia of *E. bigaulae*; 10. Female genitalia of *E. boop*.

m], 30–31.iii.1978, blacklight, J. B. Heppner (USNM). Paratypes: VENEZUELA, **Aragua**, Rancho Grande, 4♂♂, 5♀♀, 16–23.x.1966 (S. S. & W. D. Duckworth, USNM); 1♀, 1–5.xi.1966 (S. S. & W. D. Duckworth, USNM); 3♀♀, 7–8.vi.1967 (S. S. & W. D. Duckworth, USNM); 1♂, 8–14.vii.1967 (R. W. Poole, USNM); 1♂, 2♀♀, 22–31.vii.1967 (R. W. Poole, USNM); 1♂, 1♀, 22–31.viii.1967 (R. W. Poole, USNM); 3♀♀, 17–20.i.1978 (J. B. Heppner, USNM); 4♂♂, 7♀♀, 30–31.iii.1978 (J. B. Heppner, USNM); 2♂♂, 2♀♀, 1–3.iv.1978 (J. B. Heppner, USNM).

Distribution and Biology. *Eubetia bigaulae* is known only from Rancho Grande, Venezuela. With records from nearly every month, this species apparently flies throughout the year. Adults are attracted to lights.

Discussion. *Eubetia bigaulae* is easily distinguished from the following species, *E. boop*, by the presence of numerous unusual characters, including the dense row of ascending scales from the lower frons, the dense patch of androconial scales on the under surface of the forewing, the slightly expanded lobe near the base of the costa of the forewing, and the stalked condition of M_3 and CuA_1 (in both male and female). The venation, costal lobe, and frons scaling of the male of this species are unique within Euliini.

Etymology. The species name refers to the exclamation that followed its discovery—“its a new one, by golly.”

***Eubetia boop*, new species**

Figs. 6, 8, 10

Description. *Male.* FW length 7.0 mm ($n = 1$). *Head:* Frons smooth-scaled, dark brown; vertex dark brown, mixed with tan. Labial palpus dark brown mesally and laterally. Antennal scaling brown. *Thorax:* Pale yellow-gold with brown prothoracic collar. *Forewing:* Upper side pale whitish yellow with dense, irregular, tan, yellow, and reddish-brown reticulations and overscaling; brown semicircular patch bordering costa ca. 0.40–0.60 distance from base; terminal region with patches of red-brown scales. Fringe grayish tan. Under side moderately uniform dark tan-brown. *Hindwing:* Upper side light gray-brown. Fringe dingy whitish. Under side light gray-brown. *Genitalia:* As in Fig. 8 (drawn from JWB slide 749, Costa Rica; $n = 1$). Tegumen rather tall and narrow. Uncus broadened apically, slightly longer than in *E. bigaulae*. Socius rounded, pendant. Gnathos arms with broadened, crescent-shaped lobe near middle. Valva narrow, broadest distally, with upturned apex; distal 0.25 of valva with eucosminelike fine setae and spines; sacculus with triangular process subbasally; slender, curved spine from venter of valva ca. 0.5 distance from base to apex. Aedeagus broad, slightly curved; phallobase large; vesica with two irregular sclerites.

Female. FW length 6.5 mm ($n = 1$) (Fig. 6). Superficially as in male, except markings slightly more defined and lacking foreleg hairpencil. *Genitalia:* As in Fig. 10 (drawn from JWB slide 748, Costa Rica; $n = 1$). Sterigma a moderately broad, weakly spiculate band; spiculae more developed mesally along dorsal margin. Antrum not as large relative to 8th segment as in *E. bigaulae*, funnel-shaped, with narrow-triangular sclerites near junction with ductus bursae. Ductus bursae moderately long, coiled one revolution, wrinkly; colliculum present in form of an irregular sclerite. Corpus bursae irregularly triangular, wrinkly (unmated and not expanded).

Types. Holotype, ♂: COSTA RICA, **Puntarenas Prov.**, Finca Cafrosa, Est. Las Mellizas, P. N. Amistad, 1300 m, i.1991, M. M. Chavarria & G. Mora (INBio). Paratype: COSTA RICA, **Puntarenas Prov.**, 1 ♀, Est. Biol. Las Alturas, Coto Brus,, 1500 m, ix.1991 (M. Ramirez, INBio).

Distribution and Biology. *Eubetia boop* is known only from middle elevations (1300–1500 m) in Puntarenas Province, Costa Rica. Given the intensity of collecting activities in Costa Rica as a result of the parataxonomist program associated with INBio, it is unusual that so few specimens of this species are available. Adults have been captured in January and September. Nothing is known of its life history.

Discussion. This species can be distinguished from *E. bigaulae* by the characters identified above in the diagnosis of that species. In addition, *E. boop* has a triangular process from the sacculus lacking in *E. bigaulae*.

Etymology. The species name is an arbitrary combination of letters.

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